1. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99979	99967	99958	99951	99946	99941	99937	99934

   A. Non-Linear Power

   B. Exponential

   C. Logarithmic

   D. Linear

   E. None of the above

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2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 808 grams of element X and after 6 years there is 115 grams remaining.

   A. About 1 day

   B. About 2555 days

   C. About 730 days

   D. About 1095 days

   E. None of the above

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3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 15° *C bath to cool. After 16 minutes, the uranium has cooled to* 84° *C.*

A. $k = -0.04195$

B. $k = -0.04481$

C. $k = -0.04403$

D. $k = -0.04853$

E. None of the above

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4. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 190° *C and is placed into a* 12° *C bath to cool. After 20 minutes, the uranium has cooled to* 131° *C.*

   A. $k = -0.03825$

   B. $k = -0.06857$

   C. $k = -0.03865$

   D. $k = -0.02340$

   E. None of the above

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5. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 690 grams of element X and after 6 years there is 69 grams remaining.

A. About 365 days

B. About 730 days

C. About 1 day

D. About 2920 days

E. None of the above

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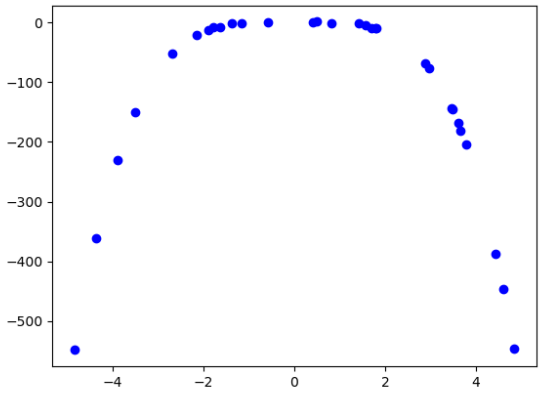
6. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Non-linear Power model

D. Exponential model

E. None of the above

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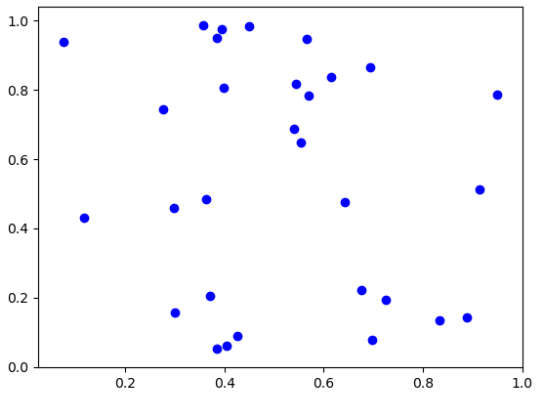
7. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Linear model

D. Logarithmic model

E. None of the above

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8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 159 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 214 minutes

   B. About 35 minutes

   C. About 352 minutes

   D. About 58 minutes

   E. None of the above

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9. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59950	59900	59850	59800	59750	59700	59650	59600	59550

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

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10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 1657 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 79 minutes

B. About 29 minutes

C. About 174 minutes

D. About 13 minutes

E. None of the above
